

# Work Order ID 73369

Wednesday, August 31, 2011 1:10:13 PM

Page 1

Item ID: D350-748-241TRN

Accept

Setup Start

Revision ID:

Stop

Item Name: Crosstube Turning Detail

Start Date: 8/31/2011 Start Qty: 1.00

Cust Item ID:

Required Date: 9/2/2011 Req'd Qty: 1.00

Customer:

Reference:

Approvals: Process Plan: CY Date: 11/08/31 Tooling:

Date:

Run Start

QC: Date: SPC (Y/N):

Date:

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
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D350-748-241	F
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100



Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

Memo

- 1-Fill tube with sand & install plugs on both ends as per Folio FA647
- 2-Turn first side as per Folio FA647
- 3- File transition lines smooth.

0.00

0.00

110



QC

Quality Control

QC1- Inspect dimensions to dimension sheet

Memo

0.00

0.00

120



Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

Memo

- 1-Turn second side as per Folio FA647
- 2- File transition lines smooth.
- 3-Scribe part # as per Dwg D350-748-241

0.00

0.00

*Tube Scrapped on B83290*

**SCRAP**

1 Ø

M.M.L 12/01/24

1 Ø

M.M.L 12/01/24

1 Ø

M.M.L 12/01/25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130  QC Quality Control	QC1- Inspect dimensions to dimension sheet  Memo	0.00  0.00							<u>1</u> <u>6</u> mm, C 12/01/25
140  QC Quality Control	QC8- Inspect parts - second check  Memo	0.00  0.00							<u>DD</u> 12-1-30
150  Crosstubes Crosstubes	Large Fab  Memo Grind machining marks.	0.00  0.00							<u>RM</u> 12-1-30

★ SEE WLD CATG ATTACHED

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W/O: 13369

## WORK ORDER CHANGES

DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
12.03.05	131	DRILL Ø0.188 TOOLING HOLE THRU CUFF. Qty (1) PER CUFF, 2" FROM END OF CUFF. <del>TOOLING</del> <del>HOLE</del> TOOLING HOLES MUST BE PARALLEL WITH HOLE IN OPPOSITE CUFF. SEE ATTACHED DWG				CP 12.03.05 051042	

Part No: D350-748-241 TRN PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

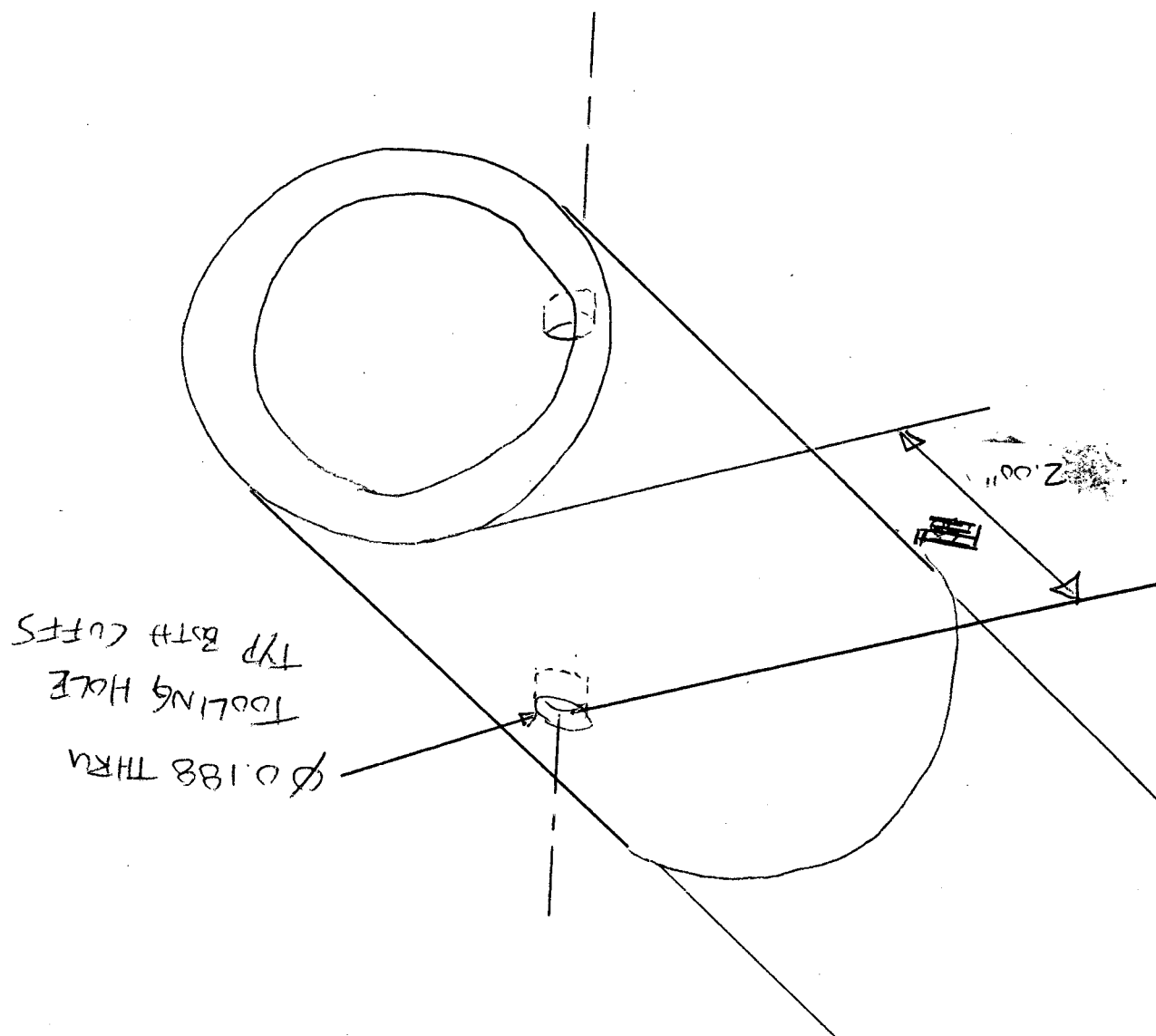
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12.03.05







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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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160 Outsource process - Heat Treat 0.00



Outsource1

Outsource process - Heat Treat

Memo

Issue P/O: 16274  
Heat Treat to min 180 KSI As per Dwg D350-748-241  
Sand Blast tube after Heat Treat  
Possible Supplier: Vac Aero  
Ensure Certificate of Conformity is attached

170 Receive & Inspect for Damage & Mat'l Certs 0.00



Packaging

Packaging

Memo

Ensure certificate of conformaty is attached

180 QC6- Inspect dimensions to drawing 0.00



QC

Quality Control

Memo

8/26/11

POSITIVE RECALL

EFFECTIVE 12/02/24 AUTH 12-03-6

RELEASED \_\_\_\_\_ DATE \_\_\_\_\_

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Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
190 	Packaging	0.00							
Packaging	Memo	0.00							
Packaging	Identify and stock in kanban rack Location: <u>B83298</u>								
200 	QC21- Final Inspection - Work Order Release	0.00							
QC	Memo	0.00							
Quality Control									

MCJ 12/08/07

W/O:		WORK ORDER CHANGES					
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# Picklist Print

Wednesday, August 31, 2011 1:10:11 PM

Page 1

Work Order ID: 73369

Parent Item: D350-748-241TRN

Parent Item Name: Crosstube Turning Detail




Start Date: 8/31/2011

Required Date: 9/2/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec  
IPP Rev B Removed polish 08.04.02 EC verified by : DD  
IPP Rev C Removed LPS-3 08.06.23 Ec verified by: DD IPP Rev D  
11.02.24 as per dwg rev.F DD verf: JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6015-125 		Manufactured	No			120	Each	22.0000	1	1			

Crosstube Material

Location

Loc Qty

Loc Code

HALL

22

61380

22

1

MANC 12/01/23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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<b>DART AEROSPACE LTD</b>		<b>Work Order:</b>	73369
<b>Description:</b> Crosstube Assembly (AS350/355 High Aft)		<b>Part Number:</b>	D350-748-241
<b>Inspection Dwg:</b> D350-748-241 Rev: D		<b>Page 1 of 1</b>	

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Inspection Sheet Drawing Dimension		Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments	
SIDE A	2.240	+0.005/-0.000	2.245	✓		vern	cwc-08	
	2.180	+0.005/-0.000	2.185	✓		↓		
	2.180	+0.005/-0.000	2.184	✓				
	2.208	+0.005/-0.000	2.212	✓				
	2.234	+0.005/-0.000	2.239	✓				
	2.253	+0.005/-0.000	2.258	✓				
	2.272	+0.005/-0.000	2.277	✓				
	2.299	+0.005/-0.000	2.302	✓				
	0.063	+/-0.010	0.063	✓		vern	cwc-08	
	4.26	+/-0.030	4.26	✓		"		
	R0.063	+/-0.010	0.063	✓		RG		
	R0.50	+/-0.030	500	✓		"		
	SIDE B	2.240	+0.005/-0.000	2.245	✓		vern	cwc-08
		2.180	+0.005/-0.000	2.185	✓		↓	
2.180		+0.005/-0.000	2.182	✓				
2.208		+0.005/-0.000	2.209	✓				
2.234		+0.005/-0.000	2.236	✓				
2.253		+0.005/-0.000	2.258	✓				
2.272		+0.005/-0.000	2.277	✓				
2.299		+0.005/-0.000	2.302	✓				
0.063		+/-0.010	0.063	✓		vern	cwc-08	
4.26		+/-0.030	4.26	✓		"		
R0.063		+/-0.010	0.063	✓		RG		
R0.50		+/-0.030	500	✓		"		
122.70		+/-0.060	122.70	✓		tape	m27-L-02	

<b>Measured by:</b>	JMM	<b>Audited by:</b>	LD	<b>Prototype Approval:</b>	N/A
<b>Date:</b>	12/01/23	<b>Date:</b>	12-1-30	<b>Date:</b>	N/A

<b>Rev</b>	<b>Date</b>	<b>Change</b>	<b>Revised by</b>	<b>Approved</b>
A	07.01.17	New Issue (P/O D350-748-201)	KJ/JLM	

W/O:		WORK ORDER CHANGES					
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ULTRA SONIC MEASUREMENTS					
Side	LOCATION on tube	R1	R2	R3	R4
A		.121	.166		
		.131	.167		
		.120	.157		
		.117	.154		
B				.114	.154
				.123	.163
				.130	.170
				.130	.165
Part number				350-248-241	
Batch number				78365	
Measured By				mmk	



Item	Qty -241	Part Number	Description
1	X	D350-748-241	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6015-125	CROSSTUBE (OR D6018-125)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6018-125  
FINISHED LENGTH = 122.700±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-241" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 29.85 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) RUN CUTTER OFF PART WHERE INDICATED. BLEND OUT ALL EDGES FROM MACHINING  
LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER  
BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO  
BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO  
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,  
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE  
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,  
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.  
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE  
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO  
CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 80 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT  
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN  
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

73369  
CL11/08/31

RELEASED  
2011-01-08

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A8-3); ADD TOLERANCES (ZN C6-3, D2-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6018-125 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN		DART AEROSPACE LTD	
DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-241	SHEET 1 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

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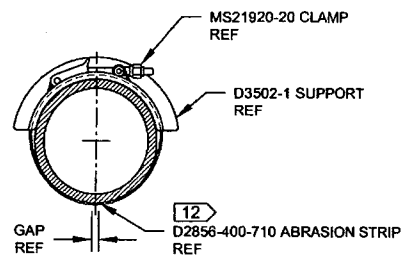
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**D350-748-241  
ASSEMBLY DETAIL**



**SECTION A-A** D4-2  
SCALE 4X

INSTALL AFTER FINISH:  
AELS-1032-225 INSERT  
NAS1149D0363J WASHER  
MS27039-1-10 SCREW

14  
D3502-1 SUPPORT  
MS21920-20 CLAMP  
2 PL

12  
D2856-400-710 ABRASION STRIP, 2 PL

D350-748-241  
BENT TUBE

**RELEASED**  
2011-05-19  
JMT

DESIGN	DP	<b>DART AEROSPACE LTD</b>	
DRAWN	DP	HAWKESBURY, ONTARIO, CANADA	
CHECKED	EB	DRAWING NO.	REV. F
MFG. APPR.	EB	D350-748-241	SHEET 2 OF 4
APPROVED	EB	TITLE	SCALE
DE APPR.	EB	CROSSTUBE (AS 350/355 HI AFT)	NTS
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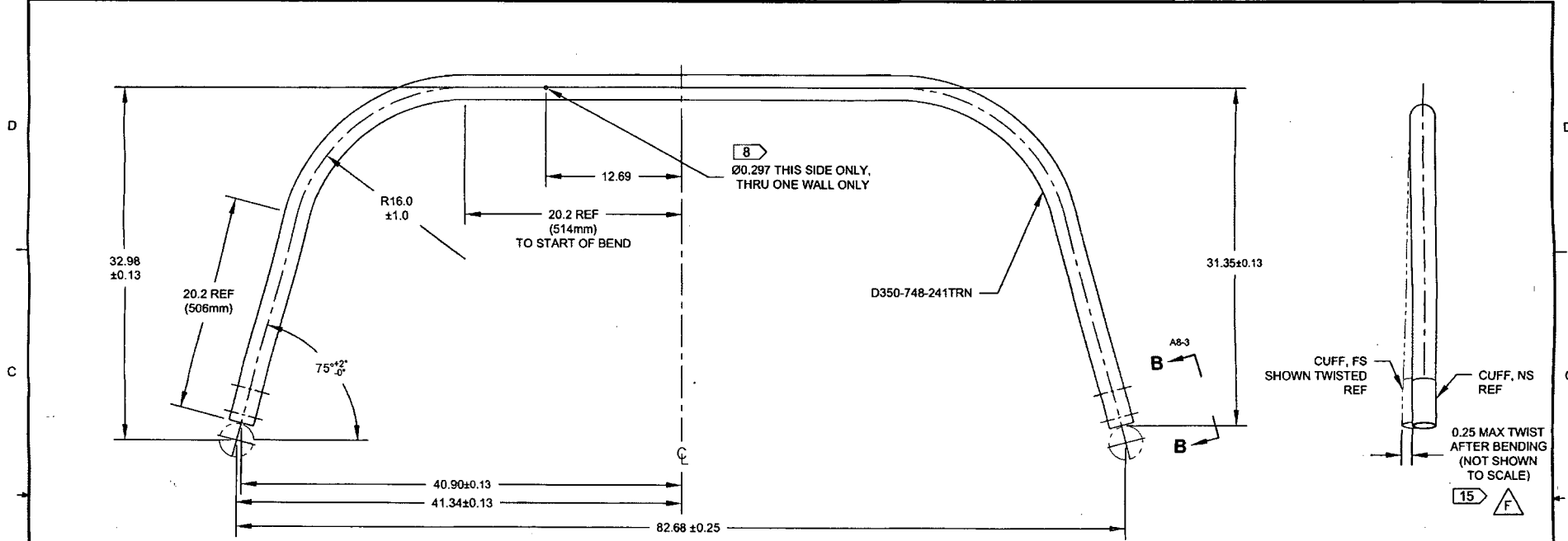
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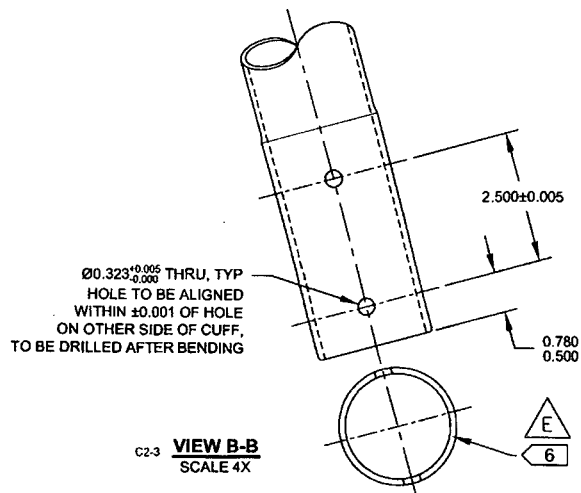
NOTE: Date & initial all entries

8 7 6 5 4 3 2 1



**D350-748-241**  
**BENDING AND DRILLING DETAIL** 10

**RELEASED**  
2011-01-18



DESIGN	90	<b>DART AEROSPACE LTD</b>	
DRAWN	90	HAWKESBURY, ONTARIO, CANADA	
CHECKED	13	DRAWING NO.	REV. F
MFG. APPR.	13	D350-748-241	SHEET 3 OF 4
APPROVED	13	TITLE	SCALE
DE APPR.	13	CROSSTUBE (AS 350/355 HI AFT)	NTS
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8 7 6 5 4 3 2 1

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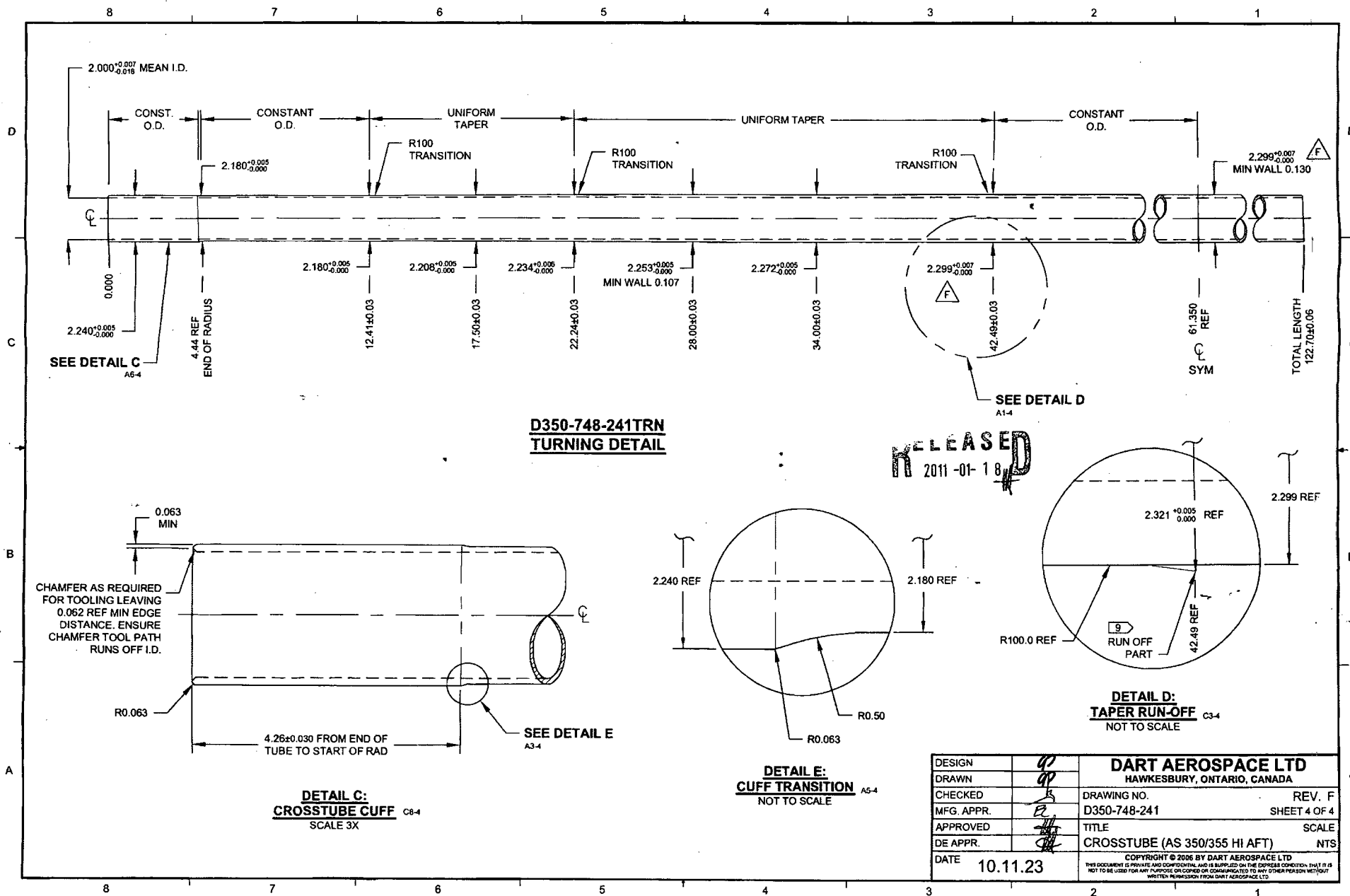
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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



1000 E. Mermald La., Wyndmoor (Phila.) PA 19038-8093  
Tel. (215) 233-2600 Fax (215) 233-5653

## Certification

### SOLD TO

Dart Aerospace Ltd.  
1270 Aberdeen Street  
Hawkesbury, ON K6A 1K7

March 28, 2012

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<b>Metlab Shop Order No:</b>	71502
<b>Purchase Order:</b>	16386
<b>Description:</b>	Crosstube
<b>Part No.:</b>	D350-748-141TRN
<b>Quantity:</b>	4 Pieces
<b>Weight:</b>	160 Pounds
<b>Material:</b>	4130 Alloy Steel
<b>Specifications:</b>	Harden and temper to 180 KSI minimum ultimate tensile strength IAW MIL-T-6736

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This is to certify that the above parts were processed as indicated above and conform to the specification requirements.

### Results:

Ultimate Tensile Strength: 181/188 KSI\*

\*Converted from 40/41 HRC surface hardness

\*\*Straightness requirement waived by Dart Aerospace Ltd

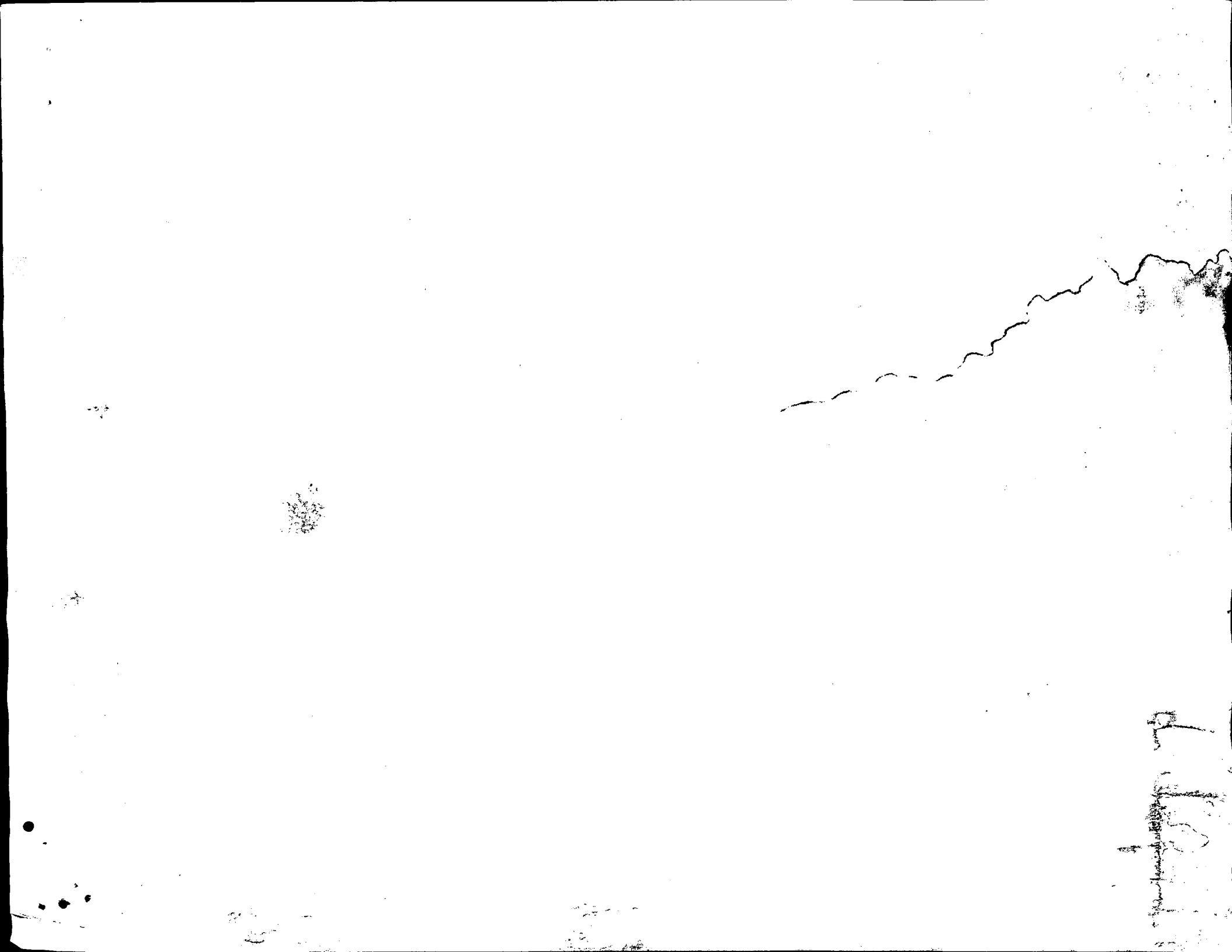
METLAB

Quality Representative Mark Jenkins

MERCURY CONTAMINATION: During the heat treating process, testing and inspections, the product did not come in direct contact with mercury or any of its compounds nor with any mercury containing device.



Heat Treating and Metallurgical Consulting





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March 28, 2012

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<b>Metlab Shop Order No:</b>	71503
<b>Purchase Order:</b>	16353
<b>Description:</b>	Crosstube
<b>Part No.:</b>	D350-748-141TRN
<b>Quantity:</b>	14 Pieces
<b>Weight:</b>	730 Pounds
<b>Material:</b>	4130 Alloy Steel
<b>Specifications:</b>	Harden and temper to 180 KSI minimum ultimate tensile strength IAW MIL-T-6736

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This is to certify that the above parts were processed as indicated above and conform to the specification requirements.

### Results:

Ultimate Tensile Strength: 181/188 KSI\*

\*Converted from 40/41 HRC surface hardness

\*\*Straightness requirement waived by Dart Aerospace Ltd

METLAB

Quality Representative { Mark Jenkins

MERCURY CONTAMINATION: During the heat treating process, testing and inspections, the product did not come in direct contact with mercury or any of its compounds nor with any mercury containing device.



Heat Treating and Metallurgical Consulting

